Figure #1: Electrical power distribution network having a composite high impedance fault detection system
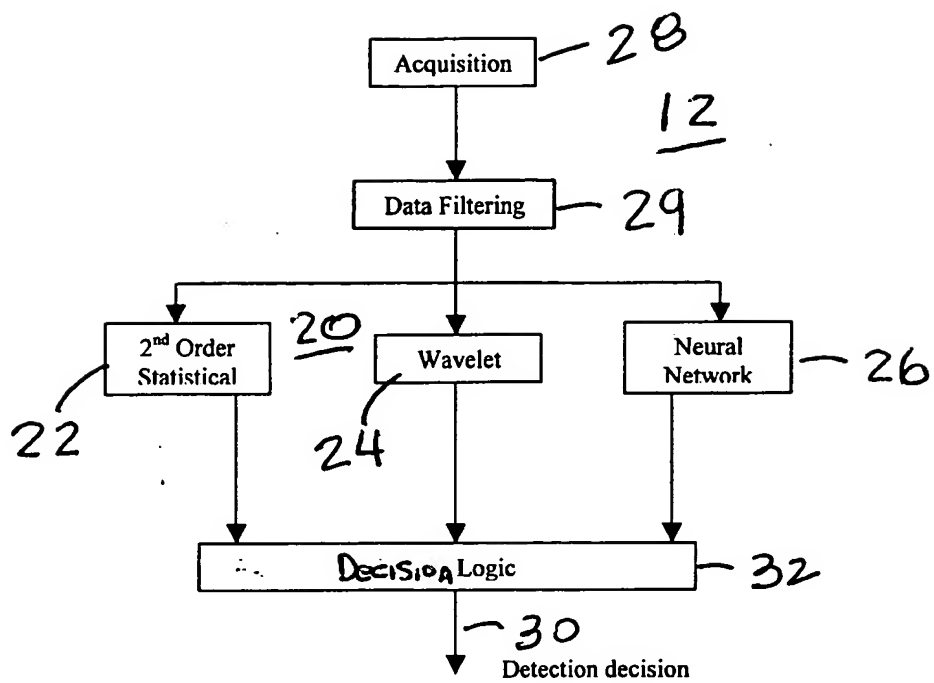
Figure #2: Block diagram of a composite high impedance fault detection system

FIG. 2a

CPU BOARD
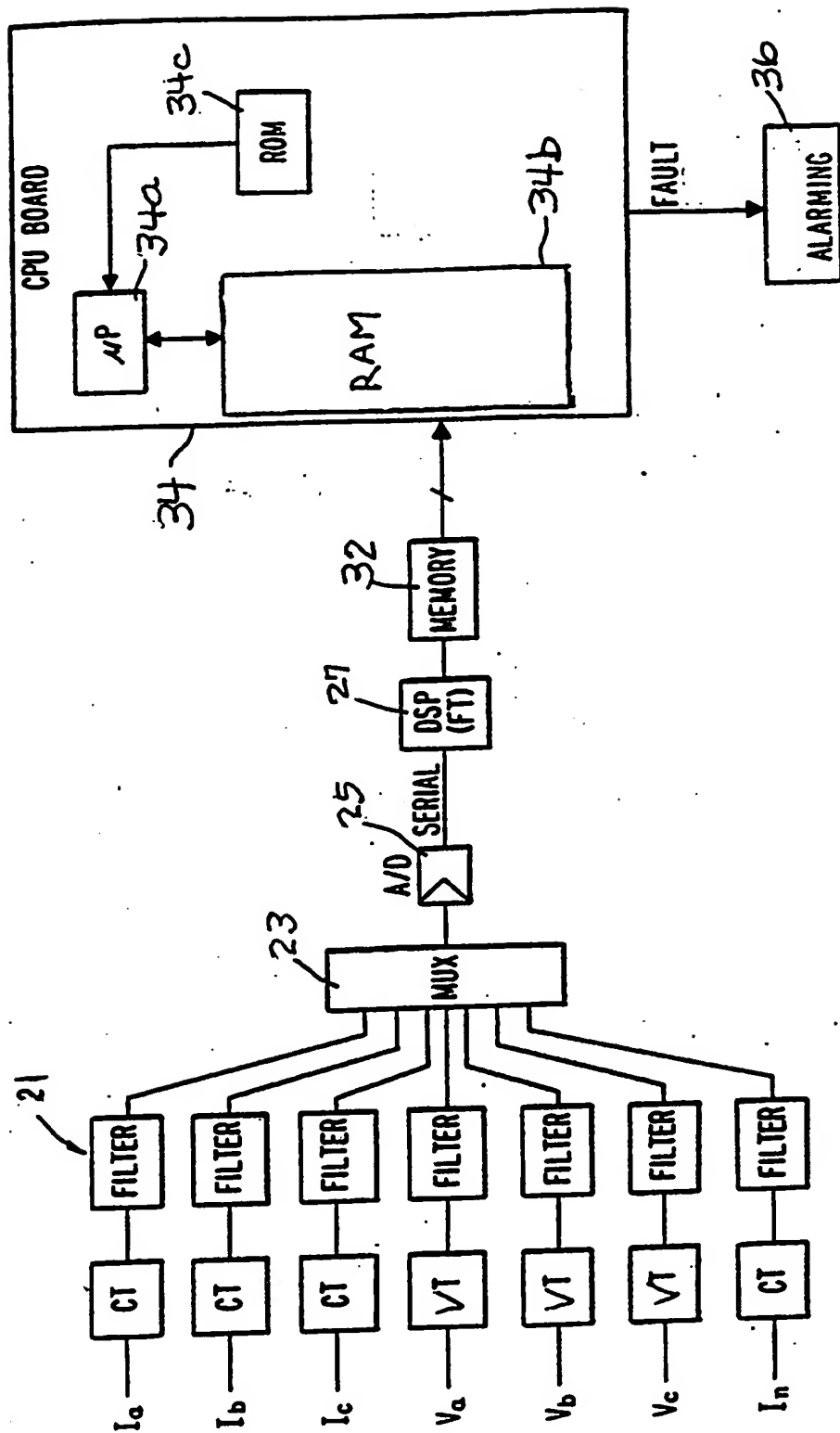
ROM 34c
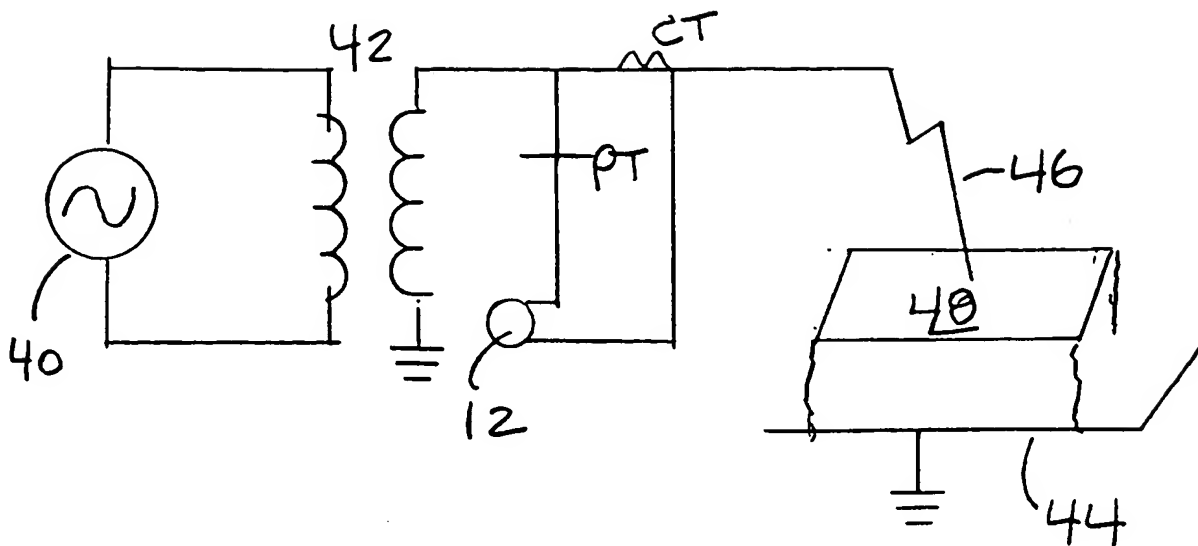
μP 34a

RAM 34b

34

FAULT

ALARMING 36

MEMORY 32

DSP (FT) 27

A/D 25

SERIAL

MUX 23

FILTER 21

CT — Iₐ
CT — I_b
CT — I_c
VT — Vₐ
VT — V_b
VT — V_c
CT — Iₙ

FIG. 3

```
┌─────────────────┐
│ Data Acquisition │ ─ 50
└─────────────────┘
        │
        ▼
┌─────────────────┐
│  Data Filtering  │ ─ 52
└─────────────────┘
        │
        ▼
┌─────────────────┐
│    Wavelet      │ ─ 54
│ Decomposition   │
└─────────────────┘
        │
        ▼
┌─────────────────┐
│    Energy       │ ─ 56
│  Calculation    │
└─────────────────┘
        │
        ▼
┌─────────────────┐
│   Comparison    │ ─ 58
│ with Threshold  │
└─────────────────┘
        │
        ▼
   Detection decision
```
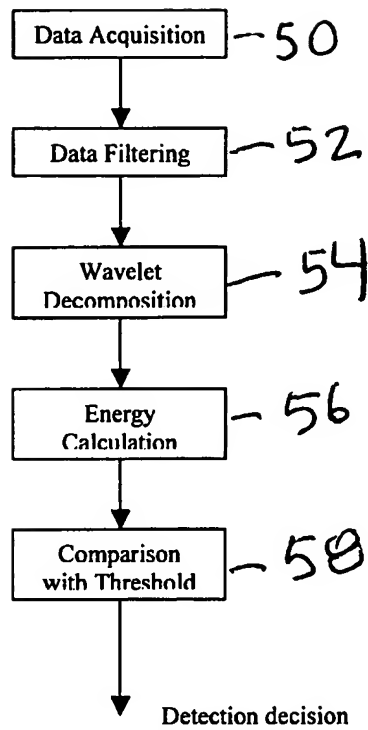
Figure #4: Flowchart showing a wavelet based high impedance fault detection system

```
┌──────────────────┐
│ Data Acquisition │  ~50
└──────────────────┘
         │
         ▼
┌──────────────────┐
│  Data Filtering  │  ~52
└──────────────────┘
         │
         │
         ▼
┌──────────────────┐
│      Energy      │  ~60
│   Calculation    │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│   Comparison     │  ~62
│ with Threshhold  │
└──────────────────┘
         │
         ▼
      Detection decision
```
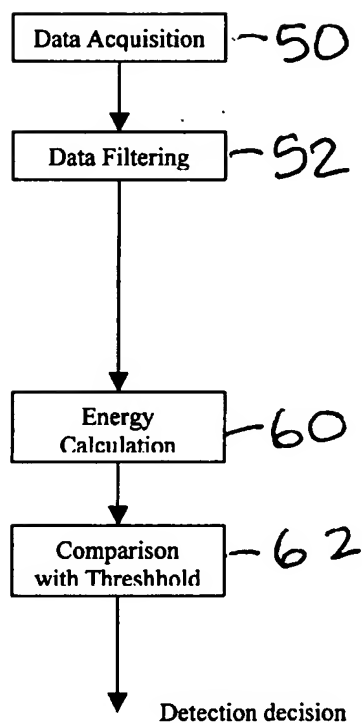
Figure # 5: Flowchart showing a 2nd order statistic based high impedance fault detection system

```
┌──────────────────┐
│ Data Acquisition │  ─50
└──────────────────┘
         │
         ▼
┌──────────────────┐
│  Data Filtering  │  ─52
└──────────────────┘
         │
         ▼
┌──────────────────┐
│       FFT        │  ─64
│  Transformation  │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│  Neural Network  │  ─66
│    Algorithm     │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│    Comparison    │  ─68
│  with Threshold  │
└──────────────────┘
         │
         ▼
      Detection decision
```
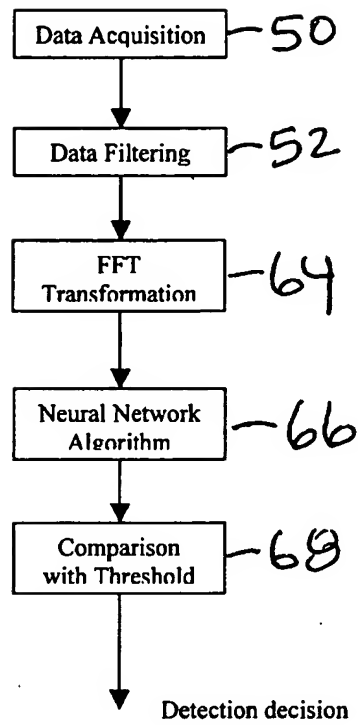
Figure #6: Flowchart showing a neural network based high impedance fault detection system